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DISEASES OF THE NERVOUS SYSTEM

A PRACTICAL JOURNAL ON PSYCHIATRY AND NEUROLOGY

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DISEASES of the NERVOUS SYSTEM

A PRACTICAL JOURNAL ON PSYCHIATRY AND NEUROLOGY

Thyroid Therapy in Some Mental Disorders

LEWIS DANZIGER, M.D., and JOSEF A. KINDWALL, M.D.

Wauwatosa, Wisconsin

In a preliminary report[1] we described the outcome of thyroid therapy, in some instances combined with more conventional treatment, in 24 patients with various types of mental disorders. Of these patients, 21 recovered while under therapy. We now report our results with a larger group of patients and compare the method with other types of treatment we have used.

At the time the statistical analysis of our records was begun (August 1, 1951), we had completed the treatment of 200 patients with thyroid, excluding from our consideration those addicted to alcohol, barbiturates and narcotics. Of this number 61 received no treatment except thyroid, nutritional therapy and psychotherapy during the period of study. The remaining 139 received thyroid, nutritional therapy, psychotherapy and one or more of various other types of treatment, including shock therapy, hormones other than thyroid, and carbon dioxide. The results in the two groups given thyroid will be compared with results obtained by us in 122 other patients given one or more conventional treatments but no thyroid.

The three groups will be referred to hereafter, sacrificing accuracy for brevity, as the Thyroid Only Group of 61; the Thyroid Plus Group of 139; and the No Thyroid Group of 122. The characteristics of the three groups, the therapy given and the results are discussed in detail, after some preliminary remarks defining the conditions of the experiment and the terms to be used.

From Department of Psychiatry, Marquette University and Milwaukee Sanitarium.

I. Definitions

1. *Sanitarium.* All patients were treated between 1946 and 1951 in the Milwaukee Sanitarium, a private institution accepting only voluntary patients. The extent of therapy was limited in the majority of cases by the willingness and the financial ability of the patients to accept treatment; these factors operated to curtail treatment in a manner which would not be a problem in a public hospital. On the other hand, the patients enjoyed certain advantages which they might not have had in a public hospital, viz.: close personal supervision, treatment beginning immediately upon admission, access to medications regardless of cost.

2. *Selection of Patients.* Included in this report are all patients treated and discharged during the period of study, except the following:

a. alcoholics and drug addicts, in whom it is difficult to recognize a successful treatment;
b. patients who, although given thyroid, had begun to improve before this therapy was initiated;
c. patients who showed no mental disorder.

3. *Diagnosis of Thyroid Disorder.* By the standards of endocrinologists and internists, most of our patients would be classified as euthyroid because the BMR fell within the accepted "normal" range and clinical signs

of myxedema were not present. As we have tried to emphasize in our preliminary report[1] there is a difference between normal and optimum; we have attempted to raise the BMR to whatever level we found to be optimum for the individual patient, without regard to "normal" standards or for what internists might conceive to be appropriate or reasonable doses of thyroid. In our own thinking we have reminded ourselves very frequently that "normal" is a statistician's term for a certain type of distribution curve which undoubtedly has advantages mathematically but which does not describe every naturally occurring distribution.

We have reminded ourselves, also, of the large experimental error in a measurement of the BMR in psychiatric patients. In the final analysis we have had to rely on therapeutic trial.

As our experiments progressed, we gradually abandoned the notion that we were treating a deficiency disease. Instead we took the position that thyroid could be administered as a drug rather than as a replacement, just as large doses of insulin are given to schizophrenics who do not necessarily have diabetes. In this concept we felt supported by the discovery that large amounts of cortisone and corticotropin can be useful in the treatment of a variety of diseases; and that estrogens in amounts which *a priori* seem fantastic are of value in pregnancy toxemias. It seems to us that these observations have broadened endocrine therapy beyond the relief of deficiency states.

4. *Thyroid Dosage.* Patients were given such dosages of thyroid as we hoped would be sufficient to raise the BMR to the upper limit of "normal" and hold it at that level. The determination of a truly basal metabolic rate in psychiatric patients is obviously a matter of some difficulty which we do not claim to have overcome in all cases. In many instances it was necessary to rely on qualitative guides such as clinical judgment of the appearance and behavior of the patient.

5. *Duration of Thyroid Therapy.* There was a wide variation in the duration of thyroid treatment which preceeded recovery. The extreme limits of the variation observed was from 5 days to 430 days for recovery. Since it is obvious that not all patients will submit to treatment indefinitely if the immediate results do not impress them favorably, it is inevitable that some will discontinue treatment before recovery. While such patients must be counted as failures, they are not failures of equal statistical weight. A patient who fails to recover in three days and then stops the treatment has not provided so severe a test as the patient who fails to recover in 750 days and then stops the treatment. The second patient obviously has given the treatment a better chance to work if it will, and failure in his case is a more serious criticism of the treatment.

In no instance was thyroid therapy stopped voluntarily by us. It was stopped because of opposition on the part of referring and other physicians or of the patients or relatives; because of the desire or indifference of patients, relatives and physicians after the patient's discharge; because of the development of toxic reactions; or because of other circumstances beyond our control. Therefore it is not true that the therapy was stopped voluntarily in any instance because the patient did not appear to us to be capable of responding. If this policy had not been adhered to, there would have existed a bias in favor of selection of easy cases and leading to the withdrawal of thyroid from those who did not respond within what to our personal intuition seemed a reasonable time.

In dealing with this problem it is not safe to make a judgment *a priori* as to what is a reasonable amount of treatment, and to say that patients who accepted less than this amount should be excluded from the calculations. It is safer to determine what percentage of patients, exposed to the treatment for a given number of days, recover within that time. When this percentage has been measured for a sufficient variety of times, the percentages can be plotted against the corresponding times and a biological assay curve drawn. In making the calculations, it is assumed that a patient who recovers after n days of treatment would also have recovered if he had been treated for n plus 1 days. This appears to be a reasonable assumption because all the patients who recovered were in fact continued on thyroid and vitamin therapy after they recovered.

It is assumed also that a patient who fails to recover in n days will also fail to recover in n minus 1 days. This is in agreement with direct observation.

These two assumptions form the basis for what students of bio-assay call the method of double integration, first suggested by Dragstedt and Lang.[2] This method was used in a preliminary survey from which it was learned that about half of the patients who recover do so after 40 to 50 days of thyroid treatment and that about half of those exposed to treatment for 50 to 60 days recover in this time. The survey was made without regard to diagnostic groupings.

From this preliminary analysis we concluded that 100 days would be the very minimum time for a reasonable trial of thyroid therapy.

6. *The Thyroid Only Group.* Patients were included in the Thyroid Only Group if:

a. they received nothing but thyroid, nutritional therapy and psychotherapy during their time in the sanitarium, or

b. they had failed to recover on other types of therapy given here or elsewhere and then were given the Thyroid Only treatment for a time.

Therefore the Thyroid Only classification does not necessarily mean that the patient never had any of the conventional treatments during the illness under consideration; but it means that if conventional therapy had been given previously, it had not succeeded.

7. *Meaning of Recovery.* Our single criterion of success was recovery of the patient. By this we mean that at the end of treatment and at the time of discharge, the patient successfully treated was free of symptoms and complaints and was able to resume his former place in society. Whether or not he expressed insight did not concern us for the purpose of evaluating therapies.

A patient who was only very much improved was counted as a complete failure unless he continued under treatment after discharge and recovered, while still under outpatient observation, at a time which could be specified.

To us, recovery does not mean that the patient will never again develop a psychiatric disability, but only that he became free of the symptoms and complaints for which treatment was sought. Nor does recovery mean to us that the patient became, necessarily, an ornament to society or that his personality became what we, as prejudiced individuals might consider good. For example, a homosexual, psychopathic, Communist murderer treated for depression would be counted as recovered if he left the sanitarium free of depression and other disturbances of mood. Similarly counted would be a Republican, Presbyterian, Rotarian, merchant who had never used bad language, alcohol, tobacco, or narcotics and had never engaged in any illegal activities or been guilty of any indiscretion, provided he recovered from his involutional psychosis.

The basic prejudices of the patient with respect to politics, religion, money, work, crime and class distinctions were considered to be his own affair. He was counted as recovered if he became free of symptoms and complaints and was able to resume his former place in society, however low or exalted.

II. Result of Treatment

The outcome of the various forms of treatment in the several types of mental disorder are shown in Table 1. Percentages are rounded to the nearest whole number.

The apparently poor results in the Thyroid Plus Group, as shown in Table 1, disappear when we eliminate from consideration those cases in which thyroid therapy was continued for less than 100 days. Table 2 shows the outcome when the patient was treated for at least 100 days in the Thyroid Only or the Thyroid Plus Group. The observed differences in percentages of success with various types of treatment are probably of little or no statistical significance. We can conclude therefore that, for the patient given this type of treatment for at least 100 days, the results are equally good in the Thyroid Only and in the Thyroid Plus Groups.

In all three groups there is a marked tendency for patients to be discharged too early. In many cases this was due to financial embarrassment, but in many others it was due to the inability of the patient or the family to permit a reasonable time for treatment. This situation would prevail to a lesser degree in public hospitals, where

usually 100 days would not be considered an unreasonably long period of treatment.

Inadequate treatment, given in nearly all cases for reasons beyond our control, was probably responsible for a large percentage of the failures in the No Thyroid Group also. Only five of the 45 failures in this group were treated for as long as 100 days.

While it is extremely difficult to judge from our data the relative efficacy of the treatments given in the three groups because of the difficulty of defining adequate treatment and of getting patients to accept such treatment, we believe the figures support the following tentative conclusions:

1. The good results to be achieved by conventional therapy and especially by shock therapy appear or begin to appear fairly early; patients and families are thus encouraged to continue with the treatment because they see prompt and even immediate results. This is particularly true, of course, in the depressive reactions treated with electric shock.

2. The good results to be achieved by thyroid therapy are much slower in developing and may not be apparent until the second or third month. While the physician is waiting for this favorable effect, which he can by no means guarantee, he is under constant pressure to do something more spectacular or more conventional. Patients and families, during this waiting period, become increasingly restive and demanding, and increasingly likely to abandon the treatment.

3. The effect of combining thyroid with conventional therapy is not bad, as might appear from inspection of Table 1. In Table 2 it is seen that the combined treatment is as efficacious as thyroid alone, if the patients given thyroid for less than 100

TABLE 1. OUTCOME OF TREATMENT

Diagnosis	*Thyroid Only Group*			*Thyroid Plus Group*			*No Thyroid Group*		
	Number of patients treated	Number of patients recovered	Per cent of patients recovered	Number of patients treated	Number of patients recovered	Per cent of patients recovered	Number of patients treated	Number of patients recovered	Per cent of patients recovered
All diagnoses	61	34	56	139	57	40	122	77	63
All psychoses	43	27	63	113	44	39	100	69	69
Dementia praecox, all types except Gjessing's	17	10	59	43	14	33	28	16	57
Periodic relapsing catatonia of Gjessing	7	7	100	17	8	47	0	0	0
Paranoid condition	2	2	100	3	2	67	3	2	67
Manic depressive psychoses, depressed type	10	6	60	36	15	42	42	35	83
Manic depressive psychoses, manic type	1	1	100	3	2	67	2	1	50
Involutional psychoses, melancholia	1	0	0	1	0	0	17	9	53
Miscellaneous and mixed psychoses	5	1	20	8	4	50	8	6	75
All Psychoneuroses	18	7	39	28	12	43	22	8	36
Psychoneurosis, reactive depression	5	2	40	7	4	57	6	3	50
Psychoneurosis, psychasthenia	1	0	0	2	1	50	0	0	0
Psychoneurosis, other and mixed types	12	5	42	19	7	37	16	5	31

TABLE 2. OUTCOME OF THYROID THERAPY AMONG PATIENTS TREATED FOR AT LEAST 100 DAYS

Diagnosis	*Thyroid Only Group*			*Thyroid Plus Group*		
	Number of patients treated	Number of patients recovered	Per cent of patients recovered	Number of patients treated	Number of patients recovered	Per cent of patients recovered
All diagnoses	45	34	76	89	57	65
All psychoses	35	27	77	71	45	63
Dementia praecox, all types except Gjessing's	14	10	71	28	14	50
Periodic relapsing catatonia of Gjessing	7	7	100	14	8	57
Paranoid condition	2	2	100	2	2	100
Manic depressive psychoses, depressed type	8	6	75	19	15	79
Manic depressive psychoses, manic type	1	1	100	2	2	100
Involutional psychoses, melancholia	1	0	0	0	0	0
Miscellaneous and mixed psychoses	2	1	50	6	4	67
All psychoneuroses	10	7	70	18	12	67
Psychoneurosis, reactive depression	4	2	50	4	4	100
Psychoneurosis, psychasthenia	0	0	0	2	1	50
Psychoneurosis, other and mixed types	6	5	83	12	7	58

days are excluded from consideration; in this table the difference between 65 and 76 per cent recoveries is without statistical significance. In our experience, the combined treatment has the advantage of giving the patient prompt, although often temporary, relief from some of his symptoms while he is waiting for the full benefit of the thyroid therapy.

4. If, as we believe, the thyroid and conventional therapies act at very different speeds, we should not necessarily expect the effects of the two types of measures to be additive. Indeed, if the therapies act on the same mechanism in the patient, whatever this may be, the results could not be additive but would of necessity be limited to the capacity of the mechanism to respond to maximum stimulation by the most effective method. Our failure to observe an additive effect is, in fact, consistent with the unitary theory of mental disorder previously proposed.[3,4]

Further details as to the diagnostic groups in Tables 1 and 2 may be of interest, and are given in the following paragraphs.

Dementia Praecox. The importance of early and extensive treatment in this disorder has previously been emphasized by us[5] and by many others. It is therefore remarkable that the mean duration of illness of the patients counted in Table 1 was 3.8 years for the Thyroid Only and the Thyroid Plus Groups and 1.7 years for the No Thyroid Group. For the patients given thyroid for at least 100 days, shown in Table 2, the mean duration of illness was 3.2 years in the Thyroid Only Group (omitting from the calculation one patient ill for 40 years), and 4.0 years in the Thyroid Plus Group.

To achieve a high percentage of recoveries among patients ill for so long a time is at least unusual. It is perhaps more remarkable that the results were achieved without any shock therapy at all in the Thyroid Only Group, and with a mean of 17.9 electric shock treatments in the Thyroid Plus Group of Table 1 and of 19.8 treatments in the Thyroid Plus patients treated for at least 100 days.

Of the dementia praecox patients in Table 1 who were given thyroid, 24 had previously failed to recover on conventional treatment. Of this group, nine patients recovered, seven of them on thyroid, vitamins and psychotherapy only. Eliminating from consideration the five patients who were given thyroid for less than 100 days, there remain in the Thyroid Only group eight patients of whom seven recovered; and in the Thyroid Plus group 11 patients, of whom two recovered.

While we share with all other clinicians the preference for cases of recent origin, we believe our methods open the possibility of recovery to other patients whose illness has been so protracted that they can expect little benefit from conventional therapy. This is shown by the following analysis of the schizophrenic patients given thyroid for at least 100 days:

Ill for two years or less: in the Thyroid Only group, of nine patients treated, eight (83 per cent) recovered; in the Thyroid Plus group, of 14 patients treated, 12 (86 per cent) recovered.

Ill for 25 to 60 months: in the Thyroid Only group, one patient was treated but did not recover; in the Thyroid Plus group, of five patients treated, two (40 per cent) recovered.

Ill for more than five years: in the Thyroid Only group, of four patients treated, two (50 per cent) recovered; in the Thyroid Plus group, of eight patients treated, one (13 per cent) recovered. The three patients in this group who recovered had been ill for seven to eight years. All three had had conventional therapy without success.

From this it is seen that a satisfactory chance of recovery is still present up to two years after the onset of illness, provided thyroid therapy is used for at least 100 days. This is very far from the case if only conventional therapy is given.[5]

The percentage of success in all our groups of schizophrenics was greater than could be expected from symptomatic therapy given in a public hospital for as long as two years. Under such conditions as prevailed in 1933 in state hospitals in the United States, the chance of recovery from dementia praecox within the first two years of hospitalization, as recalculated from Bureau of the Census data,[6] was 4.5 per 100 admissions. The chance in 1933 of being discharged improved to any degree short of recovered was an additional 24.5 per 100 admissions. After as much as two years of symptomatic treatment in a public hospital in the pre-shock era of 1933, favorable change, ranging from slight improvement to recovery, was seen in not more than 30 patients per 100 admissions with the same psychosis.

We have also exceeded the expectations indicated in a theoretical equation for shock therapy,[7] which was found to be in agree-

ment with our earlier data. According to this equation, considering the mean duration of illness and the mean extent of treatment, for the schizophrenic patients in Table 1, the expectation of recovery is five per cent for the Thyroid Plus group and 11 per cent for the No Thyroid group. The difference is accounted for by the difference in the mean duration of illness in the two groups. Assuming that insulin and electric shock benefits are additive (which we do not believe to be the case), the chance of recovery even under such combined shock therapy is, according to the equation, not more than 18 per cent in the Thyroid Plus group and not more than 31 per cent in the No Thyroid group.

It is worth emphasizing, also, that nearly all the patients showed some degree of improvement under conventional, thyroid or combined therapy. In some instances, the improvement stopped just short of recovery, and in some patients it is known that improvement continued to recovery after discharge from the sanitarium; such cases were included only if the date of recovery was known.

Periodic Relapsing Catatonia. In a personal communication, Gjessing[8] has warned against the use of shock therapy in cases of periodic relapsing catatonia, and has stressed the necessity of careful attention to the time at which thyroid therapy is begun. Our results as shown in Table 1 might seem at least superficially to give support to his views as to shock therapy; but on closer analysis we believe our results fail to agree with Gjessing's prediction.

The seven patients who were given only thyroid, vitamins and psychotherapy all recovered. Of the 17 given combined therapy, only eight (47 per cent) recovered. To what can this difference in results be attributed? If the difference is due to the shock therapy, then the more shock therapy given the worse the results should be. However, this has not been our finding. In the Thyroid Plus group, the amount of shock therapy was distributed between the successes and the failures as follows:

Group	*Mean number of ECTS*	*Mean number of insulin stupors*
Successfully treated	13	5
Unsuccessfully treated	8	5

The patient given the greatest amount of shock therapy in the Gjessing group had 32 ECTs and 24 insulin stupors in addition to thyroid before she recovered on the 106th day of thyroid therapy.

It has been our experience that many patients in the Gjessing diagnostic category show prompt although temporary relief from shock treatments.

We believe some of our poor results in the Thyroid Plus group are due to inadequate thyroid therapy. Of the nine failures, three were treated for less than 100 days. One other failure had recovered without insight when a member of the family insisted that treatment be stopped because he "knew it was crazy." The patient then relapsed and was counted as a failure. One patient, ill for 15 years, had obesity, hirsutism and amennorrhea in addition to her psychosis; she may have had some other endocrine dysfunction which we could not recognize or treat. Three other failures were accounted for by the three admissions of a single individual who is counted as a failure because he has not worked regularly.

Four of the patients in the Thyroid Only group had failed previously on conventional therapy; all recovered on thyroid. Eight patients in the Thyroid Plus group had failed on conventional therapy; five recovered on combined treatment.

Manic-depressive Psychoses. The use of thyroid in these disorders is not necessary to achieve at least a temporary recovery because the immediate response to electric shock therapy is usually satisfactory. However, some patients may refuse electric shock therapy or may, for some other reason, be unable to tolerate it.

We have treated with thyroid a total of 10 manic-depressive patients who had previously failed to recover on conventional therapy. Two of them were in the Thyroid Only group, and both recovered; of the remaining eight, five (63 per cent) recovered on combined treatment.

Psychoneuroses. Psychoneurotic patients are notoriously difficult to treat, probably because of the long duration of the illness in most cases and the patient's inability to cooperate in a lengthy treatment procedure. In this group, we found our most refractory

recoverable patient, a psychasthenic girl who finally recovered at home after 430 days; she had shown little improvement on extensive combined therapy in the hospital. Only one other psychoneurotic was treated for as long a period by us; she was improved, but did not recover.

Of seven psychoneurotic patients who had failed to recover earlier on conventional therapy, five (72 per cent) recovered while on thyroid; one was in the Thyroid Only Group and four were in the Thyroid Plus Group.

Summary. In the four diagnostic groups discussed above, were a total of 53 patients who had previously failed to recover on conventional treatment. Of these patients, 30 (57 per cent) recovered while receiving thyroid. The percentage is larger if we exclude those patients given thyroid for less than 100 days.

Even with less than 100 days of thyroid therapy, the percentage of recovery is larger than can be expected from shock therapy alone as given in a public hospital. Unfortunately, comparable statistics are not available for private hospitals. Thyroid therapy for at least 100 days appears to have the effect of increasing, by a factor of about four, the time available between the onset of schizophrenia and the beginning of successful treatment; that is, thyroid therapy gives schizophrenics who have been ill for as long as two years a good chance (more than 80 per cent) to recover, while conventional therapy must be started within the first six months of illness to give patients an equally good chance.

Thyroid offers an alternative treatment to those who are unable or unwilling to take conventional therapy. Vitamins must be given liberally to prevent the development of toxic effects or of vitamin deficiency syndromes.[9]

III. Relapse

In the two groups of patients given thyroid 91 recovered and so were thereafter exposed to the risk of relapse. Of this number, 61 (67 per cent) have been followed for the six to 72 months which have elapsed since their discharge from the sanitarium. Reports have not been received from the other 30 patients who recovered. Of the 61 followed, 28 (46 per cent) are known to have relapsed.

What caused these relapses? In 26 of the 28 cases, the relapse was preceded by reduction in the daily intake of thyroid and/or vitamins, or by the failure of the patient to see that his BMR was maintained at the recommended level. In other words, some 93 per cent of the known relapses were preceded by failure to obey the directions given at the time the patient was discharged. Most of the relapses occurred within six to eight weeks after the patient ceased to follow directions. It is suggested that all or most of these relapses could have been prevented by proper medical management of the patient.

Of these two relapses remaining to be explained, one was preceded by a course of x-ray therapy for bursitis in the shoulder. This patient later recovered again on thyroid and has remained well. The other patient relapsed for the first time after he was given penicillin for iritis. He recovered again on combined thyroid and shock treatment and remained well for 18 months. Then he relapsed a second time after he was given cortisone for iritis. He was improving again on combined therapy when he died suddenly of a coronary thrombosis.

Of the 28 who relapsed, 17 returned for further treatment, usually as in-patients. Fourteen were given thyroid again, and 10 recovered. Two of the four failures in the thyroid group were treated, after the relapse, for less than 100 days. Three relapsed patients were given only conventional treatment because of preferences on the part of relatives or the referring physicians; all three recovered.

Relapse is of special interest in dementia praecox. Of 23 who were discharged recovered, nine (39 per cent) are known to have relapsed. This is about the percentage of known relapses found in another group of schizophrenics 30 months after discharge recovered.[10] In each of the nine present cases, however, the relapse was preceded by failure of the patient to follow directions given him on discharge. From the fact of the recovery of five of the six relapsed patients who returned for at least 100 days of further thyroid treatment, the possibility arises that nearly all of the relapses in the

schizophrenic group could have been prevented.

Among the periodic catatonics, relapse regularly follows reduction of the thyroid dosage below the level critical for the patient. This is already known from the work of Gjessing.[11,12]

From our observations, we believe it fair to conclude that patients who recover on thyroid therapy rarely relapse if they maintain their thyroid and vitamin intake above the critical level, provided they avoid such severe metabolic stresses as may be produced by x-ray or cortisone treatment. If this is true, the thyroid patients have a tremendous advantage over those treated by conventional methods.

The thyroid patients enjoy an incidental benefit which they are quick to exploit. They have something definite to tell the neighbors. They go home and say in effect, "I had thyroid trouble which made me nervous." In this they find no stigma such as still attaches to those who have been treated for mental disorder by the conventional but still mysterious methods. The psychological or psychotherapeutic effect of this attitude is a factor which must be considered although not readily evaluated.

IV. Theory

"If," says A. N. Whitehead,[13] "you have had your attention directed to the novelties in thought in your own lifetime, you will have observed that almost all really new ideas have a certain aspect of foolishness when they are first presented."

While we do not claim novelty for our ideas, we are well aware that they have an aspect of foolishness, if not of feloniousness, to many. In an attempt to lessen somewhat this undesirable aspect, we present the following review of the literature which to us seems pertinent to the relation of body chemistryistry to mental disorder. We turn first to some papers which bear most directly on the problem.[1]

In a review of the literature on measurement of cerebral metabolic rate, Himwich[14] cites the evidence that cerebral oxygen consumption is within the normal range in dementia praecox and other "functional" psychoses. This does not necessarily mean that these patients enjoy cerebral metabolic rates which are optimal for them. We also have observed that the basal metabolic rates of many of our patients are within the normal range, but that the behavior was greatly improved when the rates were increased. We should, of course, be glad to know why some persons do not seem to tolerate a normal BMR but require one which is slightly above the normal range.

We wish to emphasize again the point that we are not necessarily correcting a thyroid deficiency in all our patients. On the contrary, we often used thyroid as a medication rather than as a replacement, just as we have used insulin in treating many patients who had a normal tolerance for carbohydrate. The finding of a normal blood sugar is not necessaritly a contra-indication to insulin shock therapy, which we believe is not entirely lacking in good effect.

The same comment applies to the finding of Brody[15] and of Brody and Man[16] that the serum precipitable iodine was normal in a group of 57 schizophrenics. It should be noted also that Brody and Man excluded from the group all patients with known thyroid disorders before calculating the mean values. Bowman and his co-workers[17] also found serum precipitable iodine to be normal in their schizophrenics although the average BMR was decreased below normal. They reported low BMRs in psychoneurotic patients, but in this group also the serum precipitable iodine was normal. In the depressed, the serum iodine was low but the BMR was normal; while in the elated, the serum iodine was low and the uptake of radioactive iodine was below normal.

Reiss and his co-workers[18] found the uptake of radioactive iodine decreased in anxious male patients, but increased in anxious female patients. In a second study[19] they found the rate of uptake of iodine was changed in the direction of normal by electric shock therapy, and suggested that this type of treatment may increase the output of anterior pituitary thyrotropic hormone. While this may be true, we believe it difficult to predict, from a knowledge of the rate of iodine uptake, the ability of the thyroid to produce and discharge the thyroid hormone, or the ability of the organism to react properly to the hormone.

In a very recent study, Doust[20] has re-

ported chronic anoxemia in a group of schizophrenics.

Relation of Thyroid and Adrenal Cortex. Much has been written recently about the defective response of the adrenal cortex to stress in mental disorders and especially in dementia praecox. Sluggishness of the adrenal cortex does not necessarily imply a primary deficiency in this organ, for the following reasons:

The response of the adrenal cortex to corticotropin becomes deficient after thyroidectomy in the rat[21,68] and in the hypothyroid patient.[22]

Thyroidectomy reduces the rate of formation and release of corticotropin in the rat.[23] Similarly, thiouracil causes adrenal cortex atrophy in the rat,[24-27] apparently because of failure of corticotropin production.[28] Thyroid medication produces adrenal cortex hypertrophy in the rat.[21] In hypothyroid man, thyroid therapy sometimes restores to normal the adrenal cortex response to corticotropin.[22]

In some ways, the adrenal cortex may exert a sparing action on the thyroid. For example, adrenal cortex extract increases the rate of loss of nitrogen from the tissues of the rat.[29] In myxedema, cortisone may raise the BMR but not the depressed uptake of iodine.[30] The adrenalectomized rat can concentrate iodine normally, but the normal rat given cortisone or desoxycorticosterone shows decreased iodine uptake and decreased rate of discharge of iodine from the thyroid.[31] Thyroidectomy or thiouracil reduces the output of ketosteroids,[32] and the same effect has been reported in myxedema.[33]

It is at least possible, therefore, that the reported sluggishness of the adrenal cortex in dementia praecox and in some other mental disorders may be due to poor functioning of the thyroid.

Adrenal Cortex and Respiratory Enzymes. Adrenalectomy in the rat has an adverse effect on respiratory enzymes, the importance of which in psychiatric disorders has been emphasized by one of us.[3,4] In the adrenalectomized rat, the liver, kidney, heart and skeletal muscle contain less than the normal amount of cytochrome;[34] the liver contains less than the normal amount of catalase;[35] and the liver cytochrome oxidase and succinoxidase no longer respond normally to thyroid stimulation.[36,37] The last named effect is reversed by the administration of adrenal cortex extract.[36]

Thyroid and Enzymes. The little information available as to the mechanism of thyroid activity points to an important relation to enzymes which are essential to normal brain function. Much of the work has been done on the rat.

Tissieres,[38,39] Drabkin and his co-workers[40] and Mardones and his co-workers[41] found that thyroid therapy increases the cytochrome c of rat kidney and liver; the reverse effect after thyroidectomy or thiouracil was reported by Drabkin et al.[34,40] Thyroid or thyroxin increases rat liver cytochrome oxidase and succinoxidase[42,43] but the increase in succinoxidase apparently depends on an adequate supply of riboflavin in the diet.[43] Thyroidectomy or thiouracil depresses the activity of rat liver succinoxidase or cytochrome oxidase.[37]

In the rat, thyroid increases the activity of liver xanthine oxidase[44] and thyroxin increases liver succinoxidase and muscle hexokinase.[45] Thyroidectomy decreases liver amino acid oxidase but increases the activity of this enzyme in the kidney.[46] Thyroid apparently increases the rate of phosphorous turn-over in the rat liver,[47] but decreases the activity of lactic dehydrogenase.[48]

Brophy and McEachern[49] found that thyroid increases only transiently the oxygen uptake of the rat brain, possibly due to the rapid exhaustion of the co-enzyme system.

Of great theoretical interest is the observation of Cohen and Minz[50-52] that thyroid is necessary for the incorporation of pantothenate into co-enzyme A.

In a recent review, Barker[53] has summarized the available information on the effect of the thyroid gland on enzymes.

Effect of Electric Shock Therapy. The earlier observations of Klein and Olsen,[54] who reported the stimulation of oxygen consumption in the cat brain by convulsions, were confirmed in the monkey by Bain, Pollock and Stein.[55] Dawson and Richter[56] reported changes in the phosphorous compounds of the rat brain after electrical stimulation, indicating a rapid phosphorous turn-

over. Increase in brain glycogen after convulsions was reported by Chance.[57]

A decrease in blood lymphocytes suggestive of adrenal cortex stimulation was reported after electric shock treatments by Altschule et al. and by Graham and Cleghorn, and Mikkelsen and Hutchens[58-60] and after insulin hypoglycemia by Gellhorn and Frank.[61] Increased excretion of adrenal steroids after electric shock was reported by Ashby,[62] and Gottfried[63] and Hoagland et al.[64] It appears unlikely, in view of the poor response of most psychotic patients to corticotropin, that shock therapy can exert its beneficial effect principally through the adrenal cortex.[65]

Electronarcosis is believed by Adams[66] to increase the output of thyrotropic hormone and the activity of the thyroid gland. This type of treatment was reported by Ellis and Wiersma[67] to produce hypertrophy of the thyroid, adrenals and gonads, and to increase thyrotropin output. Reiss et al.[19] also believe electric shock therapy increases the production and release of thyrotropin. While this idea is extremely interesting to us as an explanation of the good long-range effects of electric shock therapy, we believe the favorable immediate response to treatment could not be effected through a slow mechanism such as the thyroid hormone.

Conclusions. The fragments of information summarized above form much less than a complete picture. To us they suggest:

1. There is some possibility of disturbed thyroid function in mental disorder. This is shown by reduced ability of the gland to concentrate iodine in some cases, to maintain the serum precipitable iodine at normal levels in some others, and to maintain the BMR in some others.

2. The reported inadequacy of the adrenal cortex in some psychiatric patients may be a sign of thyroid deficiency.

3. Either thyroid or adrenal cortex deficiency may result in reduced production and/or function of several respiratory enzymes, especially those in the cytochrome oxidase-cytochrome-succinoxidase system. The thyroid may also control the formation of co-enzyme A.

4. Electric shock therapy probably increases the rate of oxygen consumption by the brain (at least until the available supply of oxygen is exhausted) and may stimulate thyroid and adrenal cortex function.

Even if conclusion 1 is not justified, we believe combined thyroid and vitamin therapy may well increase the supply of respiratory enzymes. Such an increase would explain the good clinical results we have obtained.

V. Summary

Combined thyroid and vitamin therapy has been given alone or in combination with conventional treatment to 200 psychiatric patients, and the results compared with the effect of conventional treatment alone which was given to 122 other patients. The results of thyroid and vitamin therapy given for at least 100 days either alone or with conventional treatment have been gratifying and compare favorabley with the results obtained by conventional methods. This is particularly true in illnesses of long duration and in patients who have previously failed to recover on conventional treatment.

Of 91 patients who recovered on thyroid and vitamin therapy, with or without other forms of treatment, 28 (46 per cent) of those followed for 6 to 72 months after discharge relapsed. In 26 of the 28 cases, relapse was preceded by reduction of the daily intake of thyroid and/or vitamins, and most of the relapses occurred within 6 to 8 weeks after the patient failed to follow directions.

Most of the patients given thyroid and vitamins were euthyroid by ordinary standards. In raising the metabolic rate to the upper limit of "normal" in some cases and to the limit of tolerance in others, we were not necessarily giving replacement therapy, but we believe we may have stimulated the production and/or function of respiratory enzymes concerned in cerebral metabolism.

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REFERENCES

1. Danziger, L., and Kindwall, J. A.: *Dis. Nerv. Syst.* 9, 231 (1948).
2. Dragstedt, C. A., and Lang, V. F.: *J. Pharm. Exp. Therap.* 32, 215 (1927).
3. Danziger, L.: *Dis. Nerv. Syst.* 6, 365 (1945).
4. Danziger, L.: *Dis. Nerv. Syst.* 10, 35 (1949).
5. Danziger, L., and Kindwall, J. A.: *Dis. Nerv. Syst.* 7, 299 (1946).

6. Danziger, L.: *Dis. Nerv. Syst.* 7, 229 (1946).
7. Danziger, L.: *Dis. Nerv. Syst.* 7, 357 (1946).
8. Gjessing, R.: Personal communication (1950).
9. McGavack, T. H.: The Thyroid, *C. V. Mosby Co.*, St. Louis (1951).
10. Danziger, L.: *Dis. Nerv. Syst.* 13, 111 (1952).
11. Gjessing, R.: *J. Ment. Sc.* 84, 608 (1938).
12. Gjessing, R.: *Archiv. f. Psychiat,* 109, 525 (1939).
13. Whitehead, A. N.: Science and the Modern World, *MacMillan Co.,* New York (1925).
14. Himwich, H. E.: Brain Metabolism and Cerebral Disorders. *Williams and Wilkins Co.,* Baltimore (1951).
15. Brody, E. B.: *Psychosom. Med.* 11, 70 (1949).
16. Brody, E. B., and Man, E. B.: *Am. J. Physiol.* 109, 357 (1950).
17. Bowman, K. M., Miller, E. R., Dailey, M. E., Simon, A., and Mayer, B. F.: *J. Nerv. Ment. Dis.* 112, 404 (1950).
18. Reiss, M., Hemphill, R. E., Maggs, R., Smith, S., Haigh, C. P., and Reiss, J. M.: *Brit. Med. J.* 1, 1181 (1951).
19. Reiss, M., Hemphill, R. E., Maggs, R., Haigh, C. P., and Reiss, J. M.: *Brit. Med. J.* 2, 634 (1951).
20. Doust, J. W. L.: *J. Ment. Sc.* 98, 143 (1952).
21. Wallach, D. P., and Reineke, E. P.: *Endocrin.* 45, 75 (1949).
22. Hill, S. R. Jr., Reiss, R. S., Forsham, P. H., and Thorn, G. W.: *J. Clin. Endocrin.* 10, 1375 (1950).
23. Halmi, N. S., and Bogdanove, E. M.: *Proc. Soc. Exp. Biol. Med.* 77, 518 (1951).
24. Florentin, P., Martin, R., and Sadoul, P.: *C. r. soc. biol.* 141, 177 (1947).
25. Freedman, H. H., and Gordon, A. S.: *Proc. Soc. Exp. Biol. Med.* 75, 729 (1950).
26. Glock, G. E.: *Nature,* 156, 508 (1945).
27. Zarrow, M. X., and Money, W. L.: *Endocrin.* 44, 345 (1949).
28. Zarrow, M. X., and Zarrow, I. G.: *Proc. Soc. Exp. Biol. Med.* 76, 620 (1951).
29. Kline, D. L.: *Endocrin.* 45, 596 (1949).
30. Beirerwaltes, W. H., Wolfson, W. Q., Jones, J. R., Knorpp, C. T., and Siemienski, J. S.: *J. Lab. Clin. Med.* 36, 799 (1950).
31. Verzar, F., and Vidovic, V.: *Helv. Physiol. et Pharmacol. Acta* 9, 214 (1951).
32. Deane, H. W., and Greep, R. O.: *Endocrin.* 41, 243 (1947).
33. De la Balze, F. A., Arrillaga, F. C., and Mancini, R. E.: *Medicine* (Buenos Aires) 11, 25 (1951).
34. Drabkin, D. L., Fourer, P., and Fetsko, J. M.: *J. Biol. Chem.* 182, 351 (1950).
35. Begg, R. W., and Reynolds, E. F.: *Science* 111, 721 (1950).
36. Tipton, S. R., Leath, M. J., Tipton, I. H., and Nixon, W. L.: *Am. J. Physiol.* 145, 693 (1946).
37. Tipton, S. R., and Nixon, W. L.: *Endocrin.* 39, 300 (1946).
38. Tissieres, A.: *Arch. internat. physiol.* 54, 305 (1946).
39. Tissieres, A.: *Arch. internat. physiol.* 55, 252 (1948).
40. Drabkin, D. L., Fetsko, J. M., and Fourer, P.: *J. Biol. Chem.* 182, 335 (1950).
41. Mardones, J., Monsalsa, J., Vial, M., and Plaza delos Reyes, P.: *Science* 114, 387 (1951).
42. McShan, W. H., Meyer, R. K., and Erway, W. F.: *Arch. Biochem.* 15, 99 (1947).
43. Tipton, S. R.: *Am. J. Physiol.* 161, 29 (1950).
44. Remy, C., Richert, D. A., Westerfeld, W. W., and Tepperman, *J. Proc. Soc. Exp. Biol. Med.* 73, 573 (1950).
45. Smith, R. H., and Williams-Ashman, H. G.: *Nature* 164, 457 (1949).
46. Cagan, R. N., Gray, J. L., and Jensen, H.: *J. Biol. Chem.* 183, 11 (1950).
47. Venkataraman, P. R., Venkataraman, A., Schulman M. P., and Greenberg, D. M.: *J. Biol. Chem.* 185, 175 (1950).
48. Vestling, C. S., and Knoepfelmacher, A.: *J. Biol. Chem.* 183, 63 (1950).
49. Brophy, D., and McEachern, D.: *Proc. Soc. Exp. Biol. Med.* 70, 120 (1949).
50. Cohen, G. N., and Minz, B.: *C.r. soc. biol.* 143, 800 (1949).
51. Cohen, G. N., and Minz, B.: *Arch. sci. physiol.* 4, 145 (1950).
52. Minz, B., and Cohen, G. N.: *C.r. soc. biol.* 143, 803 (1949).
53. Barker, S. B.: *Physiol. Rev.* 31, 205 (1951).
54. Klein, J. R., and Olsen, N. S.: *J. Biol. Chem.* 167, 747 (1947).
55. Bain, J. A., Pollock, G. H., and Stein, S. N.: *Proc. Soc. Exp. Biol. Med.* 71, 497 (1949).
56. Dawson, R. M. C., and Richter, D.: *Am. J. Physiol.* 160, 203 (1950).
57. Chance, M. R. A.: *Brit. J. Pharm. Chemotherapy,* 6, 1 (1951).
58. Altschule, M. D., Altschule, L. H., and Tillotson, K. J.: *Arch. Neurol. and Psychiat.* 62, 624 (1949).
59. Graham, B. F., and Cleghorn, R. A.: *J. Clin. Endocrin.* 11, 1469 (1951).
60. Mikkelsen, W. P., and Hutchens, T. T.: *Endocrin.* 42, 394 (1948).
61. Gellhorn, E., and Frank, S.: *Proc. Soc. Exp. Biol. Med.* 70, 112 (1949).
62. Ashby, W. R.: *J. Ment. Sc.* 95, 275 (1949).
63. Gottfried, S. P.: *Psychosom. Med.* 11, 334 (1949).
64. Hoagland, H., Malamud, W., Kaufman, I. C., and Pincus, G.: *Psychosom. Med.* 8, 246 (1946).
65. Cleghorn, R. A., Graham, B. F., Saffron, M., and Cameron, D. E.: *Canad. M A. J.* 63, 329 (1950).
66. Adams, A. E.: *Quart. Rev. Biol.* 21, 1 (1946).
67. Ellis, C. A., and Wiersma, C. A. G.: *Proc. Soc. Exp. Biol. Med.* 58, 160 (1945).
68. Vieillard, C. B., and Perloff, W. H.: *J. Phila. Gen. Hosp.* 1, 126 (1950).

Sodium Amytal Intravenously as an Aid in Psychotherapy

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I am reporting my experience with the use of sodium amytal intravenously as an aid in psychotherapy. Sodium amytal helps to eliminate tension and remove the patient's inhibitions, thus making it possible for the patient to bring up painful and disturbing subjects quicker. This helps shorten the course of treatment and helps shy or reticent patients. It has special value for those who do not understand psychodynamics and who otherwise might not accept psychotherapy. Sodium amytal intravenously can be safely used in office practice.

Review of Literature. Sodium amytal was introduced into psychiatry by Blackwenn of Wisconsin in 1929. He used it primarily for its sedative effect. His work concerns itself with its use in hospitalized psychotic cases. The psychopathological effects of sodium amytal were reported by Lindemann in 1930 in a study of twenty-four patients and four normals. He observed "in normal individuals the drug produces a mild euphoria and a release in inhibitions and reserve which usually prohibit the individual from communicating about matters of emotional significance. The same mechanism seems to be at work in psychotic patients where it makes possible communication of the thought content inaccessible to the usual means of clinical approach—It allows a period of emotional rapport with the patient and gives access to thought material which can be utilized for subsequent psychotherapeutic efforts." Horseley introduced the term narcoanalysis in 1936. He believes that the treatment is essentially diagnostic. "As a diagnostic procedure and as a means of determining further treatment it is reliable in a very high proportion of cases." Sullivan concluded: "Sodium amytal is a valuable diagnostic and therapeutic agent in psychiatry meriting more usage than given." Lambert and Rees noted that the suggestive value of the treatment and the increased confidence of the physician play an important part in this type of therapy.

During World War II the use of intravenous barbiturates received great impetus from Grinker and Spiegel. They termed their method narco-synthesis. Sergeant and Slater in England also recommended these drugs as treatment for the battle neuroses but viewed the abreactive technique as only one step in a total program.

Since the war numerous investigators have reported on various phases of the field. Wolf and Ripley note that "sodium amytal creates in the individual a state of altered consciousness associated with a marked suggestibility in which it is often possible to alter not only emotional reactions of patients but also the bodily changes that accompany them."

London found it useful to supplement regular psychoanalytic sessions with uncooperative patients. Hoch reports the best results are seen in anxiety neuroses and conversion hysteria. He also found it helpful for people of lower intelligence who cannot understand psychodynamics. Reznikoff found sodium amytal valuable as a prognostic measure before shock. If the patients lose their hallucinations or delusions with sodium amytal, he believes a better recovery can be expected with electric shock treatment. Wilbur also believes that the more the patients' behavior approaches normal under the influence of sodium amytal, the better the prognosis. Mackinnon emphasized that sodium amytal is contra-indicated in the patient in whom the giving of an intravenous injection might further increase the anxiety, because it unconsciously symbolizes a sexual or death threat.

Cline uses sodium amytal in a different way. He notes that: "Sodium amytal given intravenously, after the therapeutic interview, in relatively large doses injected very rapidly served to relieve the symptoms of anxiety for significant and increasing periods of time, and has proved to be a very effective addition to the psychotherapeutic armamentarium."

Technique

The patient is told that he will receive an injection which will make it easier for him to talk and discuss painful situations. He is informed this will require him to lie on the table for an hour but that he will not be put to sleep. The solution is mixed using a 5 cc ampule of sterile distilled water per 3¾ gr. ampule of sodium amytal. A 20 gauge needle is sufficient. An hour to an hour and a half is spent with the patient after the solution is injected. Dizziness and drowsiness can be relieved by cold water or by opening the windows and allowing more air to enter the room. Extreme heat seems to aggravate dizziness and drowsiness. Therefore, during the hot summer months, the dosage is reduced and the length of time of injecting is increased. The material is usually given at the rate of one grain per minute. Some authorities recommend the use of caffeine, either half way through the treatment or after the sodium amytal has been given. However, in four years of office practice, it has been found that the injection of the caffeine does not add to the effectiveness of the treatment. If the sodium amytal is given slowly the patient will receive the amount necessary at the appropriate rate. While under the influence of the sodium amytal, problems are discussed with the patient. Suggestions, reassurance, explanations, interpretations may be given as the situation requires. At the end of the interview, a review is made of the material received to evaluate the part the patient remembers and the portion he does not recall. For the first visit the patient is requested to be accompanied. After this, however, most of the patients may come alone. After the session is over, patient is requested to rest in a chair for about 15 minutes, and then is asked to walk about the room. Where there no longer is any dizziness, staggering gait, or disturbance of vision, the patient is allowed to leave. Patients are advised not to drive home.

Contraindications to the use of the drug listed in the literature are:

1. Severe hepatic disease.
2. Any conditions involving respiratory embarrassment because of the danger of laryngospasm, bronchial obstruction and added respiratory embarrassment.
3. Cardiac disease.
4. Marked hypertension or hypotension.
5. Advanced age.
6. Severe generalized arteriosclerosis.
7. Renal disease.

Horseley reported that he had seen no serious complications in 3000 cases. Reznikoff reported no unusual difficulties with over 500 patients. Since March 1948 some 40 patients have been treated with amytal interviews on an office basis administering several hundred injections. Neuroses and psychoses were included in this group. With proper precautions, as mentioned, no difficulties were encountered.

Observations

The patients initially experience a mild dizziness. Some compare it to an early state of anaesthesia. This stage lasts only a minute or two and then is followed by a "feeling of inner satisfaction—relaxation—relief of tension—happy feeling." These are a few of the expressions of patients. Some will speak of a lemon or orange taste and may complain of thirst. Some will ask for water but all will gladly accept it.

Under amytal, there is a marked release of inhibitions. It is easier for the patient to talk about painful subjects. As therapy proceeds, he finds it easier to bring up and discuss disturbing topics which he could not do in previous interviews. Many of the psychoses become normal in speech, ideation and behavior while under amytal. As the emotional drive is diminished, the patient is able to detach himself and look at his symptoms more objectively. It enables certain individuals to discuss experiences which otherwise they would be ashamed to mention. This method of treatment obviously appeals to shy individuals. Because it is a physical method of treatment, it is more acceptable to some patients, who would otherwise find it difficult to accept treatment from a psychiatrist. To those who find it hard to understand psychodynamics it offers another form of therapy.

Case Histories

Case 1—Patient, a young man, age 19, was seen in the office two days after creating a disturbance in a theatre. During intermission, voices told him that a priest sitting in the front row was his father.

This man, the voices said, instructed him to play a piano on the stage. It took several policemen to remove the boy. History revealed that the patient had been hallucinating for several months. Patient was given amytal interviews twice weekly for two months. He released great hostility toward his father, employer and piano teacher. He brought up problems concerning masturbation. His attitudes and fears about girls were discussed. Suggestions were offered. His symptoms were explained to him.

In two weeks, he gained sufficient insight to recognize that his symptoms had been part of a nervous illness. Five weeks after therapy commenced, patient was sufficiently improved to return to work. Patient continued with therapy for another three weeks. At the end of this time he was adapting well, symptom free, and back at his old job. Patient followed up his therapy by taking a course of dancing lessons and began to attend dances. Later he learned to drive a car. This proved valuable to him on his dates. Previous to this time he had never gone out with a girl.

Case 2—Patient was a young high school girl, age 15. One week previous to being seen, she had developed a tremor involving the middle, ring, and little fingers of the right hand. After a few days, her mother had noticed a twitch of the right side of the mouth, right elbow, and right shoulder. Patient was given only one amytal injection. She revealed that she had been having difficulty at school in two subjects, geometry and physiology. She had been passing these subjects but not with the high marks she received in others. In the physiology class, she was the only girl, which was most embarrassing. She had asked for assistance from the geometry teacher, as she found it difficult to comprehend this subject, but had been only told to study more. In addition, her parents had decided that she must become a nurse. Patient wanted to take up a business course and enter a business college. She had been afraid to tell her parents of these problems as she felt she must not oppose their wishes.

They, on the other hand, had been curbing her social activities more and more because of the school situation. A few days before her symptoms developed, she had been threatened with not being allowed to attend a school basketball game and dance.

Patient was encouraged and told that the therapist would be able to present her problems to her parents without any repercussions to her. In addition, it would be suggested to them, that they speak to the school authorities to help iron out her difficulties. Patient made a marked improvement after the interview. She was followed up with psychotherapy for 3 more hours over a period of two weeks. The somatic complaints cleared up entirely. After this, the family refused further therapy.

Case 3—Patient was a young girl of 16 suffering from attacks of depression followed by agitated episodes and confusion. These episodes had come on since the death of her grandmother four months previously. One month after this incident, the patient experienced so much difficulty with concentration that she had to leave school. Patient received amytal interviews for two months at weekly intervals followed by psychotherapy without amytal for another three months. Under sodium amytal patient stated that she had been very fond of her grandmother and loved her even more than her mother. The grandmother had often taken considerable time to discuss the patient's problems and used to advise, teach and instruct her. Patient was the oldest of six children and was very jealous of the attention given to the younger children. Her mother had little time for her. The grandmother had died suddenly while visiting patient's home. Because the grandmother had had heart attacks before, the patient had often worried about her dying. Just before the incident happened, the patient had thought to herself. "What if she died suddenly, and then she died." Because of this she had been accusing herself of the death of her grandmother.

Patient also revealed a marked sensitivity about her physical appearance. She was 5 feet 5 inches tall and weighed 150 lbs. She also blamed herself because there were many conflicts between her parents. Her father had threatened to leave home. Patient had accused herself of being the cause of this problem because she had tried to influence her father to sell the house where the trouble had started. She voiced considerable resentment against her parents, especially her mother. Her parents, particularly her mother, had accused her of being lazy. When she was feeling low and having difficulty in thinking, no one understood her or cared for her. Everyone used to "hammer at her." They used to tell her that it was all her imagination. After the death of the grandmother she had been unable to give vent to her own feelings, as her mother went into a nervous collapse. Instead, it was necessary for her to assist with the household duties and help her mother.

Patient was relieved of the guilt feelings. Reassurance and suggestions were given and the depression was relieved. She made an excellent adjustment and returned to school. A follow-up a year later showed she had completed the school year and had done well. At the time of referral, the family physician was convinced that electric shock treatment would be necessary, as several psychiatrists had already recommended it.

Case 4—Patient was a 20 year old single girl with complaints of "butterflies" in her stomach, attacks of palpitation, insomnia, loss of weight. She believed she was "too much of a boy," her skin was tough like that of a man. She complained of a lack of normal sexual feeling towards her boy friend. She had been unable to work for the past four months. Patient was given bi-weekly treatments for two months. Patient related a series of sexual episodes which were most disturbing to her. At the age of nine she had had sexual intercourse

with her brother and other boys. Then at twelve she had been enticed by the local blacksmith. When she was fourteen years of age, she had been the aggressor in homosexual experiences with two girl friends.

Patient was much relieved by the recitation and discussion of her sexual problems and sexual attitudes. Her symptoms were removed. Her attitude towards herself changed. She secured a job. She began to adjust socially and was able to feel differently towards her boy friend. One year after the last treatment she wrote that she was engaged. Five months later, I was invited to her wedding.

During 1947 and 1948 while on the West Service of the Boston State Hospital, sodium amytal intravenously was used to assist with feeding problems. The service included chronic and disturbed patients and the senile group. Whenever a feeding problem of severity arose, beyond which the usual measures failed, sodium amytal was given and never failed. In such cases, oftentimes only one or two grains of sodium amytal intravenously was necessary.

A supportive and persuasive type of psychotherapy was employed while the patient was receiving the treatment. Feeding was commenced with the needle still in the vein. As soon as the food intake became voluntary, the needle was withdrawn. This method seems to be of value in this situation, as it eliminates the vicious cycle of tube feeding. Besides more nutrition can be received more properly by the patient. One single amytal injection was usually all that was necessary. We have had the same patient refuse food several months later. However, the same technique has worked again. In some cases, tube feedings had definitely been necessary in the past.

Summary

Sodium amytal intravenously is valuable as an aid in psychotherapy. It eliminates tension and removes the patient's inhibitions. The patient can bring up painful and disturbing subjects quicker. Thus the course of treatment can be shortened. To people who are shy and reticent this is of especial value.

Since it is a physical method of approach, it has an appeal for people who do not understand psychodynamics and who otherwise might not accept psychotherapy. Sodium amytal intravenously can safely be used in office practice.

It also is useful in treating patients resistive to the taking of food. Sodium amytal can be used to encourage the taking of food instead of resorting to tube feedings.

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BIBLIOGRAPHY

1. Blackwenn, W. J.: Production of sleep and rest in psychotic cases. *Arch. Neurol. & Psychiat.* 24:365, Aug. 1930.
2. Blackwenn, W. J.: Narcosis as therapy in neuropsychiatric conditions. *J.A.M.A.* 95:1168, Oct. 18, 1930.
3. ————: Sodium amytal in certain nervous and mental conditions. *Wisc. M. J.* 29:693, Dec. 1930.
4. Cline, W. B.: Sodium amytal in treatment of anxiety states. *Dis. Nerv. Sys.* 13:48, Feb. 1952.
5. Grinker, R. R., and Spiegel, J. P.: Narcosynthesis, psychotherapeutic method for acute war neurosis, *Air Surgeon's Bulletin* (No. 2), 1:1, Feb. 1944.
6. ————: Men Under Stress. *Blakiston Co. & Phil.* 1945.
7. Hart, W. L., Ebaugh, F. C., and Morgan, D. W.: Amytal Interview. *Am. J. Med. Sc.* 210:125, July 1945.
8. Hoch, P. H.: Narcodiagnosis and narcotherapy in neuroses and psychoses. (Use of sodium amytal). *N. Y. State J. Med.* 47:2694, Dec. 15, 1947.
9. Horseley, J. S.: Narcoanalysis. *Oxford U. Press,* New York, 1943.
10. Lambert, C., and Rees, W. C.: Intravenous barbiturates in treatment of hysteria. *Brit. M. J.* 2:70, July 1944.
11. Lindemann, E.: Psychopathological effects of sodium amytal. *Proc. Soc. Exp. Biol. and Med.* 28:864, 1930.
12. London, L. S.: Hypnosis, hypnoanalysis and narcoanalysis. *Am. J. Psychotherapy* 1:443, Oct. 1947.
13. Mackinnon, H. L.: Narcoanalysis and allied procedures. *Am. J. Psychiat.* 105:224, Sept. 1948.
14. Reznikoff, L.: Narcoanalysis and narcosynthesis. *Hebrew Med. J.* 1:182, 1947.
15. Ripley, H. S., and Wolf, S.: Intravenous use of sodium amytal in psychosomatic disorders. *Psychosomatic Med.* 9:260, July 1947.
16. Sergeant, W.: Some observations on abreaction with drugs. *Digest. Neurol. and Psychiat. Inst. of Living Series* 16:193, April 1948.
17. Sullivan, D. J.: Psychiatric uses of intravenous sodium amytal. *Am. J. Psychiat.* 99:411, Nov. 1942.

Matricide With Electroencephalographic Evidence of Thalamic or Hypothalamic Disorder

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The patient, a thirteen year old boy, without premeditation, impulsively shot and killed his mother. For this study, information was available only from the boy and from his father. Birth, early development and health history were normal. Although the boy was born in 1939, the mother failed to register his birth, the father doing this in 1946. A sister born in 1944 died in the ninth month of life, cause unknown. The patient's relationship to this child could not be learned. School progress and social adjustment with his peers were above average and his adjustment to adults was considered superior. Both parents worked in factories, yet with the patient's help, cultivated a small farm. Excessive material possessions were provided for the patient.

The father, the youngest of ten children, went to work at the age of thirteen. He was over indulged in an unhappy home where there was much friction between the parents. Each of the children left home at the earliest opportunity. Several older brothers had difficulties in social adjustment and several unhappy marriages. By seventeen years of age the father was using alchohol, at times to excess. He was at one time in the State School for Boys for eleven months and later was placed on probation for a minor law infraction. The men of his family were reported to have violent tempers. From 1944 to 1947 he was in the Army, his wife and the patient being near him a greater part of this time.

The patient's mother, one of three children, with a twin brother and an older sister, came from an apparently congenial home. The father, however, was completely subjugated and dominated by his wife, seemingly accepting this in a philosophic manner. The mother of the patient and her sister came to dominate their father and brother in the manner of their mother.

In the patient's home parental relationships were not good due to the father's excessive use of alcohol and the domination and insistence on working outside the home on the part of the mother. Disagreements and quarrels were frequent and several times the mother threatened divorce.

Psychological study included the Wechsler Intelligence Scale for Children, the House-Tree-Person, Rorschach and Draw-a-Person tests. Tension and anxiety were noted throughout the testing.

Test Evaluations

Intelligence: Total scores indicate superior intellectual abilities with very superior potentialities. A large scatter among subtests and between the verbal and performance scales, indicative of a severe emotional problem, was noted.

Drawing Analysis: These indicate a dependent, needful child who wants to be accepted and liked by all, yet demonstrates hostile feelings and the need to be cautious and guarded in contacts. The need for acceptance as a male figure in the home was strong.

Rorschach: Awareness of acceptable patterns and a desire to conform to these patterns is present. Emotionally the patient is so immature that he tends to react in an impulsive, labile manner to most stimuli. He is aware of his strong underlying hostilities and at times has the desire to burst out and do as he pleases. He attempts to control these feelings by avoiding stimuli and utilizing stereotyped, acceptable behavior patterns. This tends to create anxiety and guilt feelings in the patient, whose ego controls are not strong enough to combat repeated stimulation. At times, guilt feelings become so great that the patient attempts to convert reality to suit his own needs and he

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will obstinately defend these unrealistic concepts even though he is aware of their fallacies.

Despite the impulsive and hostile tendencies this boy displays, his tendency to act out, except by verbal means, apparently was suppressed early in his development. Suppression of these aggressive feelings also had prevented the patient from assuming his role as a male. He finds it difficult to identify with the male figure, whom he sees as an inadequate yet threatening figure while at the same time he completely denies the female. No test findings were indicative of an organic component in the patient's behavior.

Psychiatric Study: The patient throughout the greater part of his life had been subjected to a most unhealthy atmosphere in his home. Early he had learned to suppress his hostile impulses and was overly conforming. In his contacts with adults he utilized a passive and conforming technique. During childhood some of his hostilities were released, first through play in which primarily there was shooting of imaginary wild animals; later he actually shot birds and small animals. There was a notable lack of emotion in regard to his shooting, except toward birds which destroyed crops and toward them he expressed extreme hatred. In the home approbation was gained by work, primarily within the house or with outside work pertaining to the home maintenance. Temper outbursts were few and as nearly as could be learned occurred only in relation to his peers. There was confusion in achieving the masculine identification which he was attempting. Possibly there is an unsolved oedipal complex which was reactivated at adolescence when further suppression became impossible. Just prior to the shooting, the mother had threatened to deprive the boy of his most meaningful relationship, his boyfriend, and had rejected both the father and the patient. This type of reaction on the part of the mother had occurred many times.

In regard to the matricide the patient states:

"She hollered so much and he (the father) said nothing. I guess I snapped. I was mad, extra mad, like I never was before. I kept this in, in a way. Yes I did for years. . . . I shot her three times, she moaned, then I reloaded and shot her three or four more times."

There was lack of affect, some confusion, and total lack of ability to describe the situation in any detail. After his act, it was reported that he had taken some bullets from a drawer, nailed a bedspread over the window and a shirt of his mother's over another window. He had gotten an axe from the basement to nail the covers over the windows, then swung the ax at the bathroom door leaving a deep gash. He remembered feeling the need to cover the windows to protect his father from the sight. No memory of getting the extra bullets from the drawer, securing the coverings for the windows, the ax, the nails or the destructive swing of the ax could be elicited from the patient.

The patient remarked that at the time the act occurred he seemed to have to do it, he could not quit. While in the detention home there were two outbursts. One was described as the boy being at "white heat with hands shaking." The patient seemed puzzled by the violence of both outbursts. Recently while describing his outbursts while in the state school he states, "They are just there. Then they just go." They recur when he is frustrated and loses status thereby.

Detailed physical and laboratory studies were made. Complete medical and neurological studies were within normal limits.

Electroencephalograms Performed 7-8-52, 7-15-52 and 11-19-52: In all instances the records were identical and reported as follows: Background activity is normal for age. While awake and during light sleep, deep sleep, and hyperventilation the entire record is marked with discharges of 6 and 14 per second positive spikes confined mainly to the right temporal, right occipital and to a lesser extent the right anterior temporal areas. Approximately four months had elapsed before the last tracing and this particular tracing was taken in a controlled pleasant environment. Six and 14 per second positive spikes are typical of thalamic and hypothalamic disorder as described by Gibbs and Gibbs.[1] It is interesting to note that in the present case, 6 and 14 per second positive spiking occurred in the waking state, for this is extremely rare; the pattern is usually seen in deep sleep. The first tracing was taken shortly after the matricide during which time the patient was under

considerable tension. The last tracing was taken approximately four months later and is unchanged. With the exception of some tension which was present at the first tracing the child appeared to be at complete ease and was most cooperative so that by the time the last tracing was made there was practically no artifact and a prolonged sleep record could be obtained.

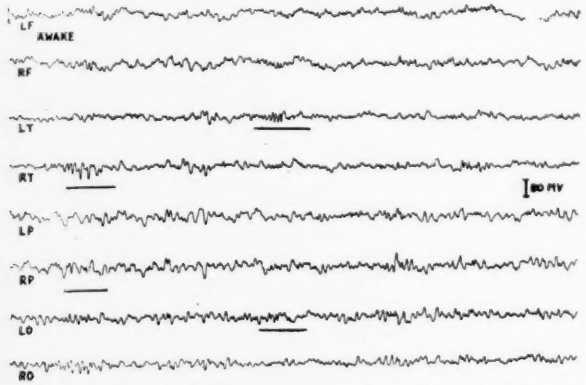

Fig. 1. Awake: Six per second and some 14 per second positive spikes are underlined.

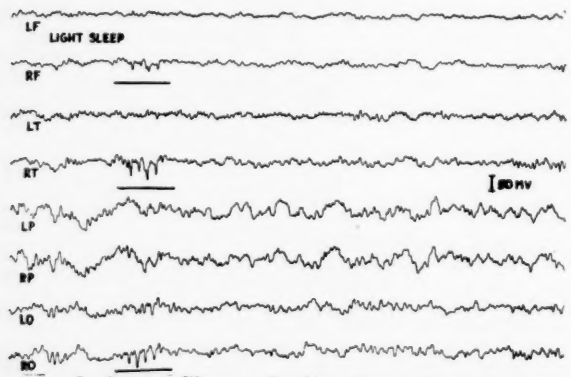

Fig. 2. Light Sleep: Section from same tracing as Fig. 1, 6 per second positive spikes (underlined) confined to right frontal, right temporal and right occipital areas.

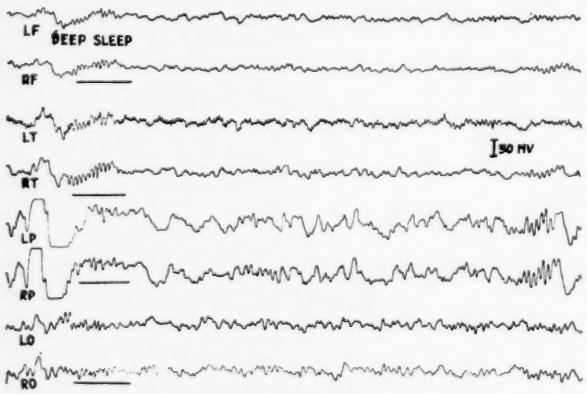

Fig. 3. Deep Sleep: Section from same record as Fig. 1. Six and 14 per second positive spikes (underlined) appear over the whole right hemisphere.

For purposes of complete study, a pneumoencephalogram was made, and the Roentgenologic report showed no abnormalities of the ventricular system.

The spinal fluid findings were entirely within normal limits; these included chlorides, sugar and microscopic examinations.

Diagnosis: Without psychosis. Thalamic or hypothalamic disorder with persistent abnormal electroencephalogram of focal 6 and 14 per second positive spikes.

Summary

A case of matricide committed by a thirteen year old by who was considered well adjusted in all respects. The abnormal electroencephalogram indicates a neurophysiologic disorder which in this instance, under apparently intense emotional stress, makes it possible for cortical control to be eliminated and involuntary and violently impulsive acts to occur with lack of feeling other than the need to complete the act. Although this child came from an unwholesome home and was rejected by his mother the detailed psychologic and psychiatric studies do not bring out highly unusual features which might account for the violently abnormal behavior of the patient. The presence of 6 and 14 per second positive spike discharges in the electroencephalogram is suggestive of disorder in the thalamus or hypothalamus. Impulsive, amnestic rage outbursts may occur in cases with such disorder without strong provocation. The homicide can be considered an extreme manifestation of the impulsive rage outburst. We have 46 cases with varying degrees of impulsive amnestic behavior and electroencephalograms similar to the case reported here. These will be published later.

BIBLIOGRAPHY

Gibbs, F. A., Gibbs, E. L.: *Atlas of Electroencephalography,* Vol. 2, 329-345, 1952.

Management of the Acutely Disturbed Patient by Sedative Electroshock Therapy

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The problem of control of catatonic, stuperous, manic or other acutely disturbed patients has always been a challenge. Adequate control of these patients is often imperative and may on occasion be life saving. Sedation by the commonly used drugs, packs and tubs is not satisfactory in many of these patients, as they may still refuse to take anything by mouth and continue to manifest signs of dehydration and other adverse effects of starvation. The camisole is not only psychologically undesirable for disturbed patients, but dangerous, as fatal injuries have occurred in the struggle for freedom from this archaic type of restraint. Tube feeding and parental alimentation may be difficult and are not without danger and require additional nursing care. Furthermore, the noise and commotion caused by disturbed patients are disconcerting and upsetting to the other patients and personnel and often stimulate quiet patients to become disturbed. When a number of patients are disturbed at the same time, the entire ward tends to become disorganized and treatment of patients is impaired.

Injuries to other patients and attendants may result from the patient's assaultiveness; and on occasion while the patient is being therapeutically restrained, he is accidentally injured. The attempt to control a disturbed patient is often interpreted by him as a direct assault on his person and so reported to his relatives. The latter, believing the patient, become provoked at the supposed ill treatment and demand explanations and apologies from the ward physician and superintendent. The ramifications as to what may occur as the result of the patient's disturbed behavior are many, and adequate control of this behavior is of the utmost importance.

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During the past eleven years, in our work with electroshock therapy (E.S.T.) at Bellevue Psychiatric Hospital and elsewhere, we have on numerous occasions observed that acutely disturbed patients become quiet and cooperative after a few shock treatments. In view of these observations, we decided to administer E. S. T. as a "sedative" to selected patients on the disturbed wards of Bellevue Hospital. The patients chosen for treatment were those who were grossly uncooperative, assaultive or refused food. A good number of the latter had a mild to severe elevation of temperature prior to treatment, which was not considered a contraindication as it was in most instances secondary to dehydration. Prior to treatment, the patients were given medical, neurologic and psychiatric examinations. These were often necessarily brief. X-rays and E. K. Gs. were omitted because the patients were uncooperative. Other laboratory and clinical procedures were done when indicated and possible. The treatment schedule followed was to administer one treatment in the morning and one in the afternoon until the patient became cooperative, and then to control him with one or two treatments daily if he relapsed.

In this communication we wish to report on the first 55 patients who received sedative E. S. T. All of these patients were given convulsions with the Reiter Electrostimulator, Model C. W. 46, an apparatus delivering a low amperage unidirectional current which we have found has certain advantages over the standard shock machines delivering a 60 cycle alternating current. The descriptions of the current, technic of administration and the advantages of this machine have been described in previous publications.[1,11]

Results

Of the patients treated, there were 41 schizophrenic reactions, 5 involutional para-

noid reactions, 5 post-partum psychotic reactions, 2 involutional depressions and 2 manic reactions. Seven of these patients were suicidal, 12 refused all food, 9 were assaultive and 20 had temperatures ranging from 100 to 104. All the patients were acutely disturbed.

All but two of the patients showed some response to the treatment, varying in degree from becoming more manageable, ambulatory and accepting of food, to the maximal result of apparent remission of the psychosis. Some showed a marked improvement in their behavior after a few treatments, but relapsed within a few days to several weeks. Retreatment usually achieved amelioration of the reaction. Of the two who failed to respond, one, a post-partum psychosis with schizophrenic manifestations, received only three treatments in two days before she was transferred to a state hospital. Her temperature dropped from 103 to 100.2 after the third treatment. The other, a schizophrenic, did not improve significantly despite nine treatments given in eight days. The temperature returned to normal in all of the 20 patients except the one cited above.

The majority of the patients received one to eight treatments, while 13 patients received ten to twenty-three treatments. In a number of patients, treatment was continued after the sedative effect had been achieved. Eight of these patients, 6 schizophrenics and 2 involutional paranoids, recovered sufficiently to go home. A few others were also sent home, but returned in a few weeks in a relapse. Many more patients would probably have recovered, if it had not been necessary, due to overcrowding, to transfer them to other psychiatric hospitals. Follow-up of these patients sent to other hospitals showed that many received additional E. S. T. and recovered sufficiently to be sent home on convalescent status.

CHART I—*No. of E. S. T. Treatments Required Before Initial Improvement (Ambulatory or Eating) Occurred.*

No. Treatments	1	2	3	4
No. Patients Showing Initial Improvement	15	22	13	3

As seen from Chart I, the sedative effect of E. S. T. is almost immediate, occurring within the first day in 37 of the patients and in all of them within 3 days.

CHART II—*No. of E. S. T. Treatments Required for Very Good Improvement (Ambulatory, Eating, Cooperative and Socializing).*

No. Treatments	1	2	3	4	5	6	7	8
No. Patients Showing Very Good Improvement	1	11	12	5	9	4	1	3

As seen from Chart II, a very good improvement, by which is meant that the patient has become cooperative, eats unassisted, is ambulatory and socializes, occurred in 46 of the 55 patients. This marked change in behavior occurred within the first two days in 24 patients and within ten days with the rest. In 7 of the patients, the improvement was moderate and consisted of return of the temperature to normal, the patient being ambulatory and accepting food. However, these cases were still hostile and uncooperative and from time to time had to be placed in restraint especially at night. No significant improvement occurred in 2 patients.

Discussion

Our findings indicate that E. S. T. produces excellent results when administered as a sedative to acutely disturbed patients and as such is occasionally life saving. To be effective as a sedative, E. S. T. must be given intensively. Our technic has been to administer one treatment in the morning and one in the afternoon until the patient improves, and then follow with one or two a day until the required result is achieved. The majority of our patients required from two to six treatments before showing definite improvement. Some of these patients, though more manageable, attentive and temperature free, were still resistive and at times assautive, but treatment could not be continued due to the necessity for transfer to a state hospital. Intensive convulsive therapy is safe, and does not produce any more complications than when given only two or three times a week.

No fractures or other somatic complica-

tions were encountered in our 55 patients. One patient died several weeks after leaving the hospital, but there was apparently no connection between her death and the E.S.T. she had received.

We did not notice gross memory changes in any of our patients, although in some patients, who were only partly improved and who were still uncooperative, memory could not be critically evaluated.

Intensive E. S. T. was first administered by Bini[2] in 1942 and practiced by a good many investigators since. Such treatments have been given patients who did not respond to the usual twice weekly treatment, to long-standing and severe psychoneurotics[3] and psychotics,[4] especially manics,[5,6] and in attempts to improve the behavior of chronically disturbed "back-ward" patients.[7,8,9,10] Some, including ourselves, have used it to shorten recovery time.[11]

Almost as many technics of intensive E. S. T. have been described as there have been investigators in its use.[12,13,14,15] Some have given one treatment a day for a predetermined number of treatments, while others have given two or more daily for a certain number of days. When multiple daily treatments have been given, some give them minutes apart, others recommend that at least an hour should be allowed to pass between treatments, while still others prefer that treatments be given morning and afternoon. As many as five or more treatments have been given in one day. As yet, the optimum number of treatments and the best spacing of these treatments during the day have not been determined. Any attempt in this direction, however, will be beset with many difficulties, as the number of treatments a patient is to receive in a day will depend on his clinical condition at the time and on the purpose the psychiatrist has in mind for administering the treatment, as well as practical, personal considerations.

All the authors who have used intensive E. S. T. are in agreement that it does not produce any more skeletal complications than ordinarily spaced E. S. T. However, they have found that transitory memory changes are common with this form of treatment.

In other patients, not included in this re- at the same sitting, spaced a minute or so apart. When two convulsions are given in this manner they are not identical. The second convulsion is usually much shorter than the first—as much as 15 to 25 seconds shorter—and the patient quite often begins to breathe before the end of the convulsion. In addition, the convulsive movements of the second convulsion are softer. We have also noted that whereas a patient might awaken in a disturbed manner from the first convulsion, the second convulsion almost invariably is very strongly sedative in its effect and produces a quiet, restful sleep.

Conclusions

1. The use of sedative E. S. T. as described above is successful in almost completely abolishing the need for restraints, seclusion and tube feeding. It prevents the ill effects of starvation and reduces the nursing care required by these disturbed patients. It helps all patients receive better nursing care. The wards are quieter and more acceptable to all patients.

2. Sedative E. S. T. prevents accidents and injuries to patients and personnel and on occasion is life saving.

3. Sedative E. S. T. appears to be a potent method in combating dehydration temperatures in disturbed, uncooperative patients.

4. When induced by low amperage unidirectional current, sedative E. S. T. produces less confusion than the 60 cycle alternating current.

5. We feel that this method of sedation has a place in the treatment of disturbed psychiatric patients.

REFERENCES

1. Impastato, D. J., Frosch, J., Robertiello, R. C., and Wortis, S. B.: Improved electro-convulsive therapy with low amperage unidirectional currents. *Dis. Nerv. Sys.* 12:3-7, Oct., 1951.

2. As quoted in Cerletti, U.: Old and new information about electroshock. *Am. J. Psychiat.* 107: 87, Aug., 1950.

3. Milligan, W. L.: Psychoneurosis treated with electrical convulsions. *Lancet.* 251:516-520, (Oct.) 1946.

4. Rothschild, D., Van Gordon, D. J., and Varjabedian, A.: Regressive shock therapy in schizophrenia. *Dis. Nerv. Sys.* 12:147-150 (May) 1951.

5. Stevenson, G. H.: The prevention of recurring manic-depressive illnesses. *Canad. M.A.J.* 64: 198-200 (Mar.) 1951.
6. Schiele, B. C., and Schneider, R. A.: The selective use of electroconvulsive therapy in manic patients. *Dis. Nerv. Sys.* 10:291-297 (Oct.) 1949.
7. Brussel, J. A., and Schneider, J.: The B.E.S.T. in the treatment and control of chronically disturbed mental patients—A preliminary report. *Psychiat. Quart.* 25:55-64 (Jan.) 1951.
8. Koenig, H. H., and Feldman, H.: Non-standard method of electric shock therapy. *Psychiat. Quart.* 25:65-72 (Jan.) 1951.
9. Sbovbi, M. A., and Goldenberg, M.: Electroshock y psicoterapia intensiva. Casuistica (Intensive electroshock and psychotherapy. Discussion). *Neuro-psiquiatrica.* 1:32-38 (Nov.) 1949.
10. Martin, M. G.: A practical treatment program for a mental hospital "Back" ward. *Am. J. Psychiat.* 106:758-760 (Apr.) 1950.
11. Frosch, J., Impastato, D., and Wortis, S. B.: Intensive electroshock treatment with Reiter apparatus. *Am. J. Psychiat.* 108:204-207 (Sept.) 1951.
12. Chodoff, P., Legault, O., and Freeman, W.: Ambulatory shock therapy. *Dis. Nerv. Sys.* 11:195-201 (July) 1950.
13. Funkhouser, J. B.: The symptomatic use of electric convulsive therapy for acute psychoses of military personnel. *Psychiat. Quart.* 22:204 (Apr.) 1948.
14. Singh, K.: Intensive electric convulsive therapy in a military hospital. *Indian Med. Gazette.* 85: 41-43 (Feb.) 1950.
15. Zeifert, M.: Convulsive shock therapy in an Army General Hospital. *Dis. Nerv. Sys.* 7:112-115 (Apr.) 1946.

Neurological Clinical Pathological Conference

of the

Cincinnati General Hospital

CHARLES D. ARING, M.D., *Editor*

CASE NO. 280075

Presentation

J.D., a 29-year-old male negro cook, was admitted to Cincinnati General Hospital at 3:15 A.M. on October 28, 1951, after having been struck by an automobile. Although never unconscious he was unable to give any details of the accident. The Life Squad was summoned and applied splints to both lower extremities which had been doubled up beneath him and gave considerable pain. He was brought promptly to the Receiving Ward.

He was admitted to the Orthopedic Service where a physical examination contained the following significant data: temperature 100.6°, blood pressure 125/80, pulse 80, and respirations 18. The patient was alert and cooperative. He lay quietly and comfortably after having been given 10 mg. of morphine sulfate intramuscularly. There was a small scalp laceration in the right frontoparietal area, a soft grade II basal systolic murmur was heard, and there was minimal deformity noted with moderate tenderness over the left thigh and right leg. X-rays showed an oblique fracture through the proximal third of the left femur, a comminuted oblique fracture through the distal third of the right tibia, and a comminuted fracture of the right fibula; overriding was seen in the first two of these. The scalp laceration was sutured, the right lower extremity put in a long leg cast, and the left thigh placed in traction with a Kirschner wire through the condyles of the tibia. A white blood cell count was 23,000 per cmm.

At 4:30 P.M. on the day following admission a nurse noted that the patient awakened very slowly and only after some prodding when she came to take his temperature. He remained drowsy and lethargic even after some minutes had passed. Several hours later a neurosurgical consultant found the following: temperature 101.6°, blood pressure 200/110, pulse 110, and respirations 30. The patient responded only to deep painful stimuli and his eyes moved about aimlessly in all directions. Episodic attacks occurred in which the arms would flex and the hands become clenched, both of these movements having an element of spasticity in them. The pulse rate rose to as high as 140 per minute and the respiratory rate to 38 per minute. Reflexes were not tested in the lower extremities because of the immobilization, but those in the upper extremities and trunk were equal and active. A lumbar puncture performed at this time showed the cerebrospinal pressure to be 300 mm. H_2O with water color fluid containing 7 white blood celss per cmm. Only the fluid in the manometer was removed because of the increased intracranial pressure.

At 11:00 P.M. the same evening (October 29) an operation was performed.

Differential Diagnosis

Dr. Daniel Osher: This patient confronts us with a common and important problem, the relationship between disease of the nervous system and trauma. Our case is that of an apparently healthy young man who was in an accident in which both legs were broken. There was a small laceration of the

scalp and he had amnesia for details of the accident so that he likely suffered a minor concussion. There was no evidence of any immediate major brain damage such as contusion, laceration, or hemorrhage. This conclusion is confirmed by the normal neurological findings, the alertness of the patient and the normal vital signs. If this man had been unconscious on admission and his illness had followed the course that it did, the problem now would be considerably more complex and difficult of solution. However, it would have still been the same basic problem of head injury followed by progressive signs and symptoms. But this man at the time of hospital admission showed no signs of head injury other than the laceration and possibly a minor concussion. However, he did show progression of signs and symptoms of nervous system involvement during his hospital course. This is a critical point in any case of injury associated with neurological disturbance. *Progression* is the word one should remember because it infers that something is being added to the effects of the initial injury. That something may be a surgically relievable lesion such as extradural, subdural or intracerebral hemorrhage; lesions that require immediate surgical intervention if life is to be preserved.

This patient apparently was doing well for a short time after leg fractures which were treated in the usual manner. Approximately 36 hours after injury he was found to be somewhat stuporous and did not respond well. Now we do not know whether or not this was the moment of onset of neurological symptoms; we are not told how closely he was observed. Perhaps he was a bit apprehensive or restless or depressed for hours before this. Within a matter of hours this man progressed to deep coma and responded only to painful stimuli. That meant that something was developing rapidly, relatively late after injury, causing progressive impairment of brain function. In neurological diagnosis we try to localize the lesion and then attempt to determine the cause. Often this requires accessory laboratory study.

Concerning localization, the patient had no obvious unilateral cerebral sign, that is, the picture was not hemiplegic. He did have evidence of serious impairment of brain function because he went into coma quickly. This could be due to a widespread lesion throughout the brain, or there may have been a relatively localized lesion, perhaps in the upper brain stem or diencephalon. In favor of a widespread type of lesion is the generalized depression of the state of consciousness.

For localization we have certain signs and symptoms suggestive of brain stem lesion. He had some changes in his vital signs and a little fever which with severe fractures and other injuries may not be significant. The fever does not remind me of hyperpyrexia such as one sees in hypothalamic disturbance. He did have an increase in blood pressure which may occur in rapidly expanding lesions of the cranial cavity and is thought to be due to pressure on vegetative centers in the brain stem. There is usually a marked increase in systolic pressure with possibly either a normal or moderate increase in diastolic pressure. Both systolic and diastolic blood pressure were increased in this man. Associated with increasing blood pressure one sees slowing of pulse and respiration. This is not a universal phenomenon but often occurs with rapidly expanding lesions. This man had rapid pulse and respiratory rate. These changes in his vital signs are more suggestive of brain stem damage than an acutely increased intracranial pressure. He also had episodic attacks in which the arms would flex and the hands would clench. These attacks are suggestive of decerebrate rigidity; they do not sound like ordinary convulsive episodes without the clonic element. Decerebrate seizures may occur in brain-stem lesions. These spastic-rigid phenomena could not have been observed in the legs because of their immobilization.

Thus, we have a man who rapidly became unconscious and developed signs of decerebrate rigidity with some changes in vital signs. He did not have a hemiplegic syndrome, although he may have had for a short time before he was observed. The importance of this is that if he had had a rapidly expanding extradural hemorrhages and had not been observed closely, he may have quietly entered the quadriplegic decerebrate state due to the brain stem compression occasioned by transtentorial shift, and the

hemiplegic phase may have been missed. But the evidence is against a unilateral intracranial lesion.

Thus our attempt at localization is feeble and in this instance we need the help of the laboratory to aid with localization and etiologic diagnosis. The first laboratory test one should require in a case of this kind is a roentgen study of the skull to search for fracture and to look for shift of the pineal gland if it be calcified. Chest x-rays are also useful in neurological diagnosis to obtain help with metastatic tumor, heart complications, pneumonia, etc. Apparently no x-rays were taken prior to surgery.

A spinal tap was done and revealed increased intracranial pressure of 300 mm. of water with only 7 white blood cells and no red cells in the fluid. The latter is a strong point against hemorrhagic intracranial lesion. However, it does not rule it out. In a patient who had an injury followed by a lucid interval and then rapidly progressed into deep coma, the next diagnostic step would be to do exploratory burr holes. This is a relatively harmless procedure and is absolutely necessary in order to rule out hemorrhage within the cranium.

What are some of the diagnostic possibilities in a case like this where there had been a lucid interval followed by rapidly progressive neurological deterioration? Our first thought concerns intracranial bleeding, extra and subdural hemorrhage, traumatic subarachnoid bleeding and intracerebral hemorrhage. In this particular case I want to consider extradural hemorrhage first. This condition is classically described as a head injury followed by a brief lucid interval and then rapid progression of deepening coma, contra-lateral hemiplegia, and often homolateral dilatation of the pupil with the frequent x-ray demonstration of a fracture across the channel of the middle meningeal artery. This classical example is one that is most frequently seen but many cases of extradural hemorrhage may have a somewhat different picture. In the first place the so-called lucid interval may be only a change from deep unconsciousness to a slightly more responsive state and then return again to the deeply unconscious state. Extradural hemorrhage while usually due to tearing of the middle meningeal artery may result from a rent in a large venous sinus. It is helpful to think of extradural hemorrhage as acute, subacute or chronic in types. The acute type is usually associated with a torn middle meningeal artery or a torn sinus and presents a rapidly progressing state. In the subacute form the progression of symptoms may occur four days to a week after injury; there is bleeding from the fracture line itself from torn diploic venous channels and the clot may form in a slower manner. Finally there is chronic extradural hemorrhage which again is often associated with fracture but the patient may not develop symptoms for weeks after the injury. This is due to very slow oozing and accumulation of blood underlying the fracture. These patients will develop papilledema and signs of increased pressure late after the injury and often do not show much in the way of localizing signs. In the case at hand no fracture was demonstrated but this is not essential for the diagnosis of an extradural hemorrhage. There were also no localizing signs or pupillary change. However, the time interval is compatible with an extradural hemorrhage and the possibilities of atypical location of the bleeding, as for example in the posterior fossa or along the floor of the skull have to be considered. I believe this diagnosis most unlikely.

Subdural hematoma may occur in an acute or chronic form. Acute bleeding into the potential space between the arachnoid and dura is often associated with tearing of the brain and arachnoid in severe injuries, or there may be tearing of bridging veins or anomalous penetrating veins going through bone and directly into the brain. The blood accumulation in this condition is different than in extradural hemorrhage. In the latter, bleeding is usually limited by the dural adhesions at the suture line so that the hemorrhage acts as a localized mass pushing the brain downward. The subdural space is free of obstruction and a good deal of blood can collect here and spread widely as a layer over the surfaces of both hemispheres and under the falx. These hemorrhages are usually venous and in most patients bleeding stops spontaneously; the hemorrhage itself is of no great clinical significance. Occa-

sionally an acute subdural hemorrhage may form in large quantity and markedly depress the brain and cause severe brain damage or death. Usually in an acute subdural hematoma the outcome is dependent on the associated brain damage rather than the subdural blood. This condition is often found during exploratory burr holes to rule out extradural hemorrhage. I treat them by draining to the outside as it is almost impossible to find the bleeding point. This patient did not have focal signs and I do not believe he had an acute subdual hemorrhage. Chronic subdural hematoma is something different and does not enter into the discussion of this case.

Traumatic subarachnoid hemorrhage is quickly ruled out in this man because of the clear cerebrospinal fluid. It is a common condition in acute head trauma but in itself is usually of no great clinical significance and often results in some fever and stiff neck. The arachnoid has the power to quickly clear itself of blood.

Intracerebral hemorrhage is most unlikely in view of the lack of focal signs and bloody spinal fluid as well as the relatively mild initial symptoms.

I believe that the patient's symptoms are not due to any traumatic hemorrhagic phenomena. There is one other condition, subdural hygroma, which can produce a similar picture of an acute expanding lesion. This is not a rare condition. It is thought to be produced by head trauma which causes a small tear in the arachnoid. With each pulsation of the brain, cerebrospinal fluid is forced out through this small tear into the potential subdural space and cannot get back into the subarachnoid space because of a flap-valve type of action of the torn arachnoid. Thus, in a relatively short time a large amount of fluid can be pumped into the subdural space causing compression of the brain. This usually is bilateral and can produce profound symptoms over a period of several days. Subdural hygroma could fit the picture in this particular patient. It might be bilateral and produce no hemiplegic signs, there might not be bloody spinal fluid, there would be increased intracranial pressure and rapid progression of signs. I believe the possibility of this lesion is one of the reasons why exploratory burr holes should have been done.

Other remote possibilities consist of traumatic thrombosis of various vessels particularly the sagittal sinus or superficial cortical vessels but these are quite rare and unlikely here. Patients with sagittal sinus thrombosis may have mental depression and coma. They often have focal convulsions and focal signs and frequently have blood in the spinal fluid. The lesion produces hemorrhagic infarctions usually on both convexities of the cerebral hemispheres. I do not think this was the case in this patient.

So, with the information we have at hand I believe this man should have been taken to surgery and explored. I do not think that any acute expanding lesion was found. If a biopsy was taken I would expect only some cerebral edema and petechial hemorrhages.

Fat embolism is the condition that could best explain the entire picture. This man had severe injuries to the long bones which contain fat in the marrow. With a severe injury the marrow veins could have been torn and fat liberated into the blood stream, thus producing fat embolism. Normally there is some fat present in the blood in the form of phospholipids, cholesterol, cholesterol esters, and neutral fat. Neutral fat is present in the form of very tiny particles less than a micron in diameter. These can be seen with a dark field microscope. In severe injury to the long bones the marrow is crushed as well as the adjacent soft tissue fat. The filmy membranes of the fat in this abnormal environment tend to rupture and liberate a liquid neutral fat. If this neutral fat gets into the circulatory system through veins torn at the site of injury, the particles can travel all over the body. These neutral fat particles measure from 4 to 20 microns in diameter. Thus some of them are large enough to be held up by the small arterioles and capillaries and if this occurs the area supplied by these vessels will become infarcted. This neutral fat is attacked by an enzyme called lipase and broken up into fatty acids which are very irritating and can cause actual necrosis of the vessel walls with rupture and petechial hemorrhages. These fatty acids in themselves can destroy tissue and cause focal necrosis. In

fat embolism these fat particles go to every tissue in the body. However, the signs and symptoms are chiefly referable to the lungs, kidneys, skin and brain but in pulmonary fat embolism one sees respiratory difficulty and usually cyanosis. Petechial hemorrhages may occur in the skin, often the first valid clinical sign that fat embolism has occurred. Fat may occur in the sputum or in the urine.

In the brain one sees widespread changes with petechial hemorrhage, edema, and thus increased intracranial pressure. Localizing signs may occur but are not common. However, the brain stem signs that this patient exhibited probably were due to fat emboli lodging here. Clinically the patient often at first shows restlessness and apprehension, then rapidly becomes delirious and progresses into a deepening coma. Decerebrate fits may occur and there may be some temperature elevation and changes in vital signs.

Most of the cases reported in the literature have ended fatally, mortality being from 70 to 90 per cent. However, this may be misleading since the diagnosis is usually made by an alert pathologist doing fat stains on tissue obtained at autopsy. Thus patients with severe injuries, especially if there are associated head injuries, may show a delirium or changes in the state of consciousness and if the clinician is not cognizant of the possibility of fat embolism, the diagnosis may be missed and these patients may recover from "head injury." The differential diagnosis of fat embolism includes head injury, post-traumatic shock, drug idiosyncrasies, diabetic coma, oversedation, and similar conditions. I do not believe the patient had any of these.

At the present time there is no known specific treatment for fat embolism. Treatment is supportive. Some workers believe that tying off the femoral vein might prevent further showers of fat emboli. Recently there have been reports that heparin is of aid in these cases. In dogs it has been found that choline chloride may reduce the mortality from experimental fat emboli. Possibly most important is the prevention of fat embolism which may be a complication of improper handling of long-bone fractures and recalls the old axiom "splint them where they lie." Ray[1] had 6 patients, none of whom died; this tends to substantiate the statement made above that these cases are often incorrectly diagnosed clinically and the high mortality rate is probably due to the fact that most of the cases are diagnosed by the pathologist.

Dr. Aring: The patient was taken to the operating room quite promptly. Burr holes were placed. Nothing was seen in the epidural or the subdural spaces that shouldn't have been there. Therefore, a ventriculogram was done. Dr. Levin, will you tell us about the roentgen studies?

Dr. Emanuel Levin: There are seen the shadows of the burr holes. The ventricular system is of normal size and shape. There was no deviation from the midline or local areas of compression. The important radiological demonstration in this case is the numerous fractures. You may see a fracture of the tibia and the fibula on the right and of the left femur. The patient was in a splint so that we could not get the best pictures, nevertheless the fractures are clearly visible. You can see that they are very extensive and comminuted, involving the left femur, the right tibia, and fibula high, and the right tibia and fibula in the lower portion near the ankle.

Dr. Aring: The students made many diagnoses, most of them mentioned by Dr. Osher in his excellent discussion. Seven thought that the patient had some degree of concussion, 2 contusion of the brain, 9 voted for hematoma—2 of these extradural and 7 subdural. One student thought that this case represented a bilateral subdural hemorrhage, one diagnosed a sagittal sinus thrombosis, 5 fat embolism, 4 ventured no diagnosis. Seventy-five per cent of the students reporting considered fat embolism in their written discussions.

Dr. J. Park Biehl: What happened to the patient? Did he die?

Dr. Aring: Yes, he was treated vigorously by the methods that Dr. Osher mentioned. He became increasingly worse dying three days after the operation. An occasional petechiae was seen before operation. These increased in number as the course of the illness progressed.

Dr. John Braunstein: I'd like to ask Dr. Osher about the size of the particles in fat

embolism. Do they presumably strain out in the lungs for the most part, or do they get by?

Dr. Osher: It used to be thought that pulmonary symptoms occurred first in fat embolism and then several days later after enough fat had squeezed through the pulmonary capillaries, cerebral symptoms occurred. Another theory was that the pulmonary capillaries were larger than capillaries in other viscera and brain. However, these particles have been measured and their sizes have been reported as varying from 4 to 20 microns and thus they are small enough to go anywhere in the body. I believe that it is probably the breakdown of the neutral fat into the irritating necrotizing fatty acids that causes the eventual lesion rather than the neutral fat emboli blocking the vessels themselves.

Discussion of Pathology

Dr. William Baird: The autopsy was performed 5 hours after death. The abnormalities in the general autopsy were: massive pulmonary edema with confluent lobular pneumonia bilaterally (this pneumonic process was considered to be the immediate cause of death), multiple petechial hemorrhages of the skin, subpleura and viscera, simple comminuted fractures of the left femur, right tibia and right fibula, fat emboli in the lungs, kidneys and elsewhere.

The brain weighed 1450 grams. Grossly there could be seen multiple small hemorrhages throughout the brain, involving both grey and white matter of hemispheres and brain stem. There were several locales where the hemorrhages were confluent and a bit more than that usually termed petechial. Microscopically there were multiple small ring hemorrhages, many perivascular in distribution, shot through the parenchyma. There was not a great deal of organization; there were a few polymorphonuclear cells in and about the hemorrhagic areas. The diagnosis was confirmed by staining with Sudan IV, which in our case demonstrated fat in many vessels and in perivascular areas. These preparations must be mounted in glycerine and therefore we cannot project them on the screen since the heat is too much for them. We have set up several microscopes so that the students may, after the conference, see typical areas of fat embolism stained for fat.

We have seen some half dozen cases of fat embolism this year in the neuropathology laboratory. It is believed that fat embolism is much more common than has been thought to be the case. It is not always fatal. Vance[2] in a study of 59 extensive long-bone fractures was able to find fat emboli in some 20 of them.

Clinical Diagnosis

Fat embolism to brain and other organs.

Fractures of left femur, right tibia and fibula.

Lobular pneumonia.

Dr. Osher's Diagnosis

Fat embolism to brain and other organs.

Fractures of left femur, right tibia and fibula.

Anatomical Diagnosis

Fat embolism to brain, skin, pleura, and viscera.

Fractures of left femur, right tibia and fibula.

Massive pulmonary edema.

Lobular pneumonia.

REFERENCES

1. Ray, R. B.: Fat Embolism; A Report of 6 Cases. *South M.J.* 44:499-506, June 1951.
2. Vance, B. M.: The Significance of Fat Embolism. *Arch. Surg. of Chicago,* 23:426-465, 1931.

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